

Dynamic modelling of reversible methanolysis of *Jatropha curcas* oil to biodiesel

ABSTRACT

Many kinetics studies on methanolysis assumed the reactions to be irreversible. The aim of the present work was to study the dynamic modeling of reversible methanolysis of *Jatropha curcas* oil (JCO) to biodiesel. The experimental data were collected under the optimal reaction conditions: molar ratio of methanol to JCO at 6 : 1, reaction temperature of 60°C, 60 min of reaction time, and 1% w/w of catalyst concentration. The dynamic modeling involved the derivation of differential equations for rates of three stepwise reactions. The simulation study was then performed on the resulting equations using MATLAB. The newly developed reversible models were fitted with various rate constants and compared with the experimental data for fitting purposes. In addition, analysis of variance was done statistically to evaluate the adequacy and quality of model parameters. The kinetics study revealed that the reverse reactions were significantly slower than forward reactions. The activation energies ranged from 6.5 to 44.4 KJ mol⁻¹.

Keyword: Methanolysis; Dynamic modeling; *Jatropha curcas* oil; Stepwise reactions.